Weisong Wen, Member of IEEE, Member of ION
Associate Director of Intelligent Positioning and Navigation Laboratory
Assistant Professor, Department of Aeronautical and Aviation Engineering
The Hong Kong Polytechnic University, Hong Hom, Kowloon, Hong Kong
Tel: (852) 3400-8234 Email: welson.wen@polyu.edu.hk
Web, Google Scholar, LinkedIn, ORCID, GitHub, Zhihu
Research Interest: GNSS, Navigation, Trustworthy Autonomous Systems, Mapping, and Localization, Robotics

Education:

- Ph.D. in Mechanical Engineering, The Hong Kong Polytechnic University, Hong Kong — 2020
- Visiting Ph.D. in Mechanical Engineering, University of California, Berkeley, U.S — 2018
- M.Sc.in Mechanical Engineering, China Agricultural University, China — 2017
- B.Sc. in Mechanical Engineering, Beijing Information Science and Technology University, China — 2015

Selected Awards and Fellowships:

- Shortlisted in PolyU Young Innovative Researcher Award (10/50) — 2021
- TechConnect World Innovation Conference and Expo, Innovation Award, U.S — 2021
- Best Presentation Award, ION GNSS+ 2020, U.S — 2020
- First Prize in Hong Kong Section in Qianhai-Guangdong-Macao Youth Innovation and Entrepreneurship Competition, Shenzhen, China — 2020
- Excellent Project Award in Songshan Lake Innovation and Entrepreneurship Competition, Dongguan, Guangdong, China — 2018
- National Scholarship for Graduate Students, Beijing, China — 2016
- Excellent Graduate of Beijing, China — 2015
- China Telecom Scholarship. (Only One Candidate per University) — 2014

Selected Working Experience:

The Hong Kong Polytechnic University, Hong Kong
Sept 2023 – Present, Assistant Professor, Aviation and Aeronautical Engineering
Apr 2021 –Aug 2023, Research Assistant Professor, Aviation and Aeronautical Engineering
Jan 2021 – Apr 2021, Senior Research Fellow, AAE

Idriverplus (Autonomous Driving Startups), Beijing, China
2016 – 2017, Research Algorithm Engineer with the autonomous driving research group

Institute of Automation, Chinese Academy of Sciences, Beijing, China
2014 – 2015, Research Assistant with the autonomous driving research group

Selected Professional Service:

Workshop Leading Chair, *IEEE ITSC 2022*, Workshop: intelligent Vehicle Meets Urban: Safe and Certifiable Navigation and Control for Intelligent Vehicles in Complex Urban Scenarios (2nd Edition), Bilbao, Bizkaia, Spain.
Session Chair, *ION GNSS+ 2023*, Special Session: All-Source Intelligent PNT Methods, Colorado, U.S.
Session Chair, *IPIN 2022*, Special Session: Indoor maps, Indoor Spatial Data Model & Indoor Mobile Mapping, and 3D building models, Beijing, China.
Session Chair, *ION GNSS+ 2022*, Special Session: ALTERNATIVE TECHNOLOGIES FOR GNSS-DENIED ENVIRONMENTS, Colorado, U.S.

Workshop Leading Chair, *IEEE ITSC 2022*, Workshop: intelligent Vehicle Meets Urban: Safe and Certifiable Navigation and Control for Intelligent Vehicles in Complex Urban Scenarios, Macau, China.
Session Chair, *ICGNC 2022*, Special Session: Intelligent Navigation and Advanced Information Fusion Technology, Harbin, China.
Leading Guest Editor in *Frontiers in Robotics and AI*, Navigation, Perception, Control for Unmanned Autonomous Systems in Dynamic Urban Scenarios, 2021.
Leading Guest Editor in *Electronics*, Advanced Integrated Navigation Methods, 2022.
Young Editorial Board Member in *Journal of Marine Science and Application*. (2021~)
Editorial Board Member in *The Open Transportation Journal*. (2022~)
Editorial Board Member in *Information*. (2022~)
Editorial Board Member in the *Journal of Data Science and Intelligent Systems*. (2023~)
Regular reviewer in *IEEE Transactions on Intelligent Transportation Systems* (2017~), *IEEE Intelligent Transportation Systems Magazine* (2017~), *IEEE Sensors Journal* (2018~), *IEEE Transactions on Vehicular Technology* (2017~), *IEEE International Conference on Robotics and Automation* (2019, 2020, 2021), *IEEE International Conference on Intelligent Robots and Systems* (2019, 2020, 2021).

Selected Invited Talks:

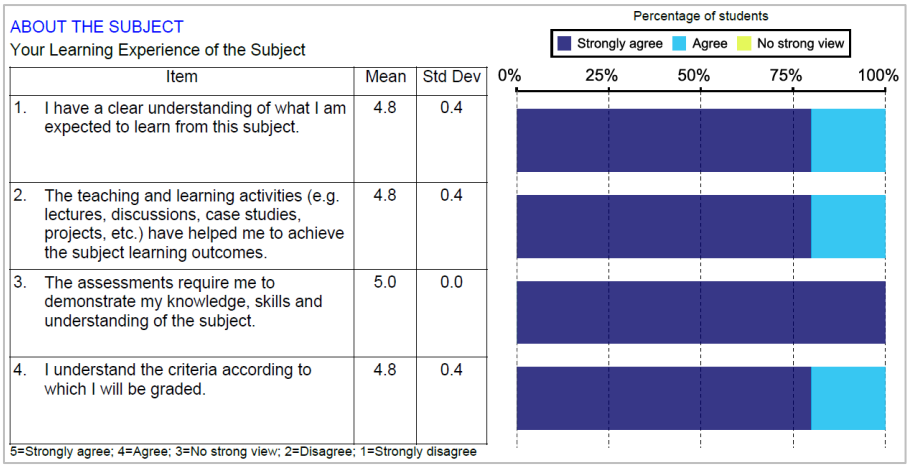
- Navigation Research group in Wuhan University, Wuhan, China. 2020

Navigation Research group in Wuhan University, Wuhan, China. 2020

- Riemann Laboratory, Huawei Technologies, Dongguan, China 2020
- Shenzhen Institutes of Advanced Technology, Chinese Academic of Sciences, China. 2019
- Mechanical System Control (MSC) Lab, University of California, Berkeley, CA, U.S. 2018
- Autonomous Driving Research Groups in Baidu.inc, Jingchi. inc, Deepmap.ai, CA, U.S. 2018

Selected Teaching Experience:

- AAE4203, Guidance, and Navigation (semester 1, 2022/2023) 2022
- AAE2004, Introduction to Aviation System and Air Transport Regulation (*With Dr. Li-Ta Hsu*) 2022
- AAE4203, Guidance, and Navigation (semester 2, 2021/2022) 2022
- AAE4002, Undergraduate Capstone Project 2021
- ENG1003 Freshman Seminar for Engineering (*With Dr. Li-Ta Hsu*) 2021



ABOUT THE SUBJECT

Your Learning Experience of the Subject

Item	Mean	Std Dev
1. I have a clear understanding of what I am expected to learn from this subject.	4.8	0.4
2. The teaching and learning activities (e.g. lectures, discussions, case studies, projects, etc.) have helped me to achieve the subject learning outcomes.	4.8	0.4
3. The assessments require me to demonstrate my knowledge, skills and understanding of the subject.	5.0	0.0
4. I understand the criteria according to which I will be graded.	4.8	0.4

5=Strongly agree; 4=Agree; 3=No strong view; 2=Disagree; 1=Strongly disagree

Student Feedback Questionnaire for AAE4203 Guidance, and Navigation (semester 1, 2022/2023). The overall score is 4.8 out of 5.

Photos with part of the students for AAE4203 Guidance, and Navigation (semester 1, 2022/2023).

Selected Research Grants (Past 5 Years):

- **PI**, PolyU Start-up Fund for New Recruits, *Vehicle-infrastructure Collaboration for Connected Unmanned Ground and Aerial Vehicles in Complex Urban Canyons* (Project amount: HK$700,000; Project period: Oct 15, 2023–Oct 14, 2025; Status: On-going)
- **PI**, Research Center of Deep Space Exploration (RC-DSE), *Multi-robot Collaborative Operations in Lunar Areas for Regolith Processing* (Project amount: HK$1000,000; Project period: Dec 1, 2023–Dec 1, 2025; Status: Granted)
- **PI**, Tencent Research Award, *Intelligent Integration of GNSS/IMU/Visual Using Factor Graph Optimization for Vehicular Navigation in Urban Canyons* (Project amount: RMB$200,000; Status: project approved) (*Knowledge Transfer to Unmanned Autonomous Systems*)
- **PI**, Research Institute for Advanced Manufacturing (RIAM) Fund, "*Unmanned Aerial Vehicle Aided High Accuracy Addictive Manufacturing for Carbon Fiber Reinforced Thermoplastic Composites Material*" (Project amount: HK$500,000; Project period: May 8, 2023–May 9, 2025; Status: Granted)

- **Co-PI**, Hong Kong Innovation and Technology Fund (ITF), *Advanced Smart Mobility Road-Side and Edge System* (Project amount: HK$2,500,000 out of HK$12,500,000; expected project period: Jul 2023~Nov 2024; Status: project approved)
- **PI**, External Project Matching Fund (EPMF) Scheme from project Research Institute for Land and Space (RILS), "*Safety-certifiable UAV System for Terrain and Civil Infrastructure Inspection*" (Project amount: HK$300,000; Project period: Jan 1, 2023–Jan 2, 2025; Status: On-going)
- **PI**, Meituan Research Award, *Vision Aided GNSS-RTK Positioning for UAV System in Urban Canyons* (Project amount: RMB$300,000; Project period: Jan 2023~Jan 2024; Status: Ongoing) (*Knowledge Transfer to Unmanned Autonomous Systems*)

PolyU Collaborates with Meituan to Develop Vision-aided Positioning System for Parcel Delivery by Drones in Urban Canyons.

The research on unmanned autonomous systems for aerial logistics with UAV is interviewed by 香港信报 at Hong Kong with Video on 31 March 2023.

- **PI**, Natural Science Foundation of Guangdong, *Research on 3D LiDAR Aided Urban GNSS Positioning Algorithm* (Project amount: RMB$100,000; Project period: Oct 1, 2021–Sept 30, 2024; Status: Ongoing)
- **PI**, Hong Kong Innovation and Technology Commission, Research Matching Grant Scheme on project "*Huawei-PolyU High-accuracy Localization Project (second phase)*" (Project amount: HK$1,075,000; Project period: Aug 27, 2021–Aug 28, 2024; Status: On-going)

- **PI**, Huawei Technologies, *Huawei-PolyU High-accuracy Localization Project (second phase)* (Project amount: HK$2,150,000; Project period: Aug 27, 2021–Aug 28, 2022; Status: Completed) (*Knowledge Transfer to Unmanned Autonomous Systems*)
- **PI**, PolyU AAE Startup Fund, *Gaussian Mixture Models for GNSS Error Noise Characterization in Urban Canyons for Autonomous Systems* (Project amount: HK$50,000; Project period: Apr 26, 2021–Apr 25, 2023; Status: On-going)
- **PI**, PolyU Startup Fund, *Resilient GNSS Positioning for Autonomous Aerial Vehicle in Urban Scenarios* (Project amount: HK$200,000; Project period: Apr 26, 2021–Apr 25, 2023; Status: On-going)
- **Co-PI**, Research Funding Scheme for Supporting Intra-Faculty Interdisciplinary Projects 2021/22, *Perception-based GNSS PPPRTK/LVINS integrated navigation system for unmanned autonomous systems operating in urban canyons* (Project amount: HK$400,000; Project period: Apr 20, 2022– April, 2023; Status: On-going)
- **Co-PI**, Huawei Technologies, *Factor Graph Optimization for GNSS Positioning* (Project amount: HK$1,260,000; Project period: Apr 20, 2021– Feb 20, 2022; Status: On-going) (*Knowledge Transfer to Smart Devices*)

Selected Research Grants *Under Submission*:

- **PI**, Guangdong Basic and Applied Basic Research Foundation (Key Project), Research on Key Technologies of Beidou-based Multi-robot Collaborative High-precision Positioning in Complex Urban Environment (Project amount: CNY 1000,000; Status: ***Under submission***)

Selected Representative Journal Publications (Past 5 Years): (*: Corresponding author)

1. Liu, X., **Wen, W***. and Hsu, L.T., 2023. GLIO: Tightly-Coupled GNSS/LiDAR/IMU Integration for Continuous and Drift-free State Estimation of Intelligent Vehicles in Urban Areas. *IEEE Transactions on Intelligent Vehicles*. *[Accepted]*
2. Hsu, L. T., Huang, F., Ng, H. F., Zhang, G., Zhong, Y., Bai, X., & **Wen, W**. (2023). Hong Kong UrbanNav: An Open-Source Multisensory Dataset for Benchmarking Urban Navigation Algorithms. *NAVIGATION: Journal of the Institute of Navigation*, *70*(4).
3. Yan, P., **Wen, W***. and Hsu, L.T., 2023. Integration of Vehicle Dynamic Model and System Identification Model for Extending the Navigation Service Under Sensor Failures. *IEEE Transactions on Intelligent Vehicles*.
4. Zhang, L., **Wen, W***., Zhang, T., and Hsu, L.T., 2023. An Improved Inertial Preintegration Model in Factor Graph Optimization for High Accuracy Positioning of Intelligent Vehicles. *IEEE Transactions on Intelligent Vehicles*.
5. Ye, J., Li, C., **Wen, W.**, Zhou, R., and Reppa, V, 2023. Deep Learning in Autonomous Surface Ships: Current Development and Challenges, *Journal of Marine Science and Application*.
6. **Wen, W**.*, Bai, X., and Hsu, L.T., 2022. 3D Vision Aided GNSS Real-time Kinematic Positioning for Autonomous Systems in Urban Canyons, *NAVIGATION: Journal of the Institute of Navigation*.
7. Hsu, L.T., and **Wen, W**., etc, 2022. Hong Kong UrbanNav: An Open-Sourced Multisensory Dataset for Benchmarking Urban Navigation Algorithms, *NAVIGATION: Journal of the Institute of Navigation*.
8. Zhong, Y., Huang, F., Zhang, J., **Wen, W. *** and Hsu, L.T., 2021. Low-cost Solid-state LiDAR/Inertial Based Localization with Prior Map for Autonomous Systems in Urban Scenarios. *IET Intelligent Transport Systems*.
9. Li, X., Li, S., Shen, Z., Zhou, Y., Wang, X., Li, X., and **Wen, W**., 2021. Continuous and precise positioning in urban environments by tightly coupled integration of GNSS, INS,

and Vision, *IEEE Robotics and Automation Letters*.

10. **Wen, W**., & Hsu, L. T. (2022). AGPC-SLAM: Absolute Ground Plane Constrained 3D Lidar SLAM. *NAVIGATION: Journal of the Institute of Navigation*, *69*(3). (Paper, Video) (*Knowledge Transfer to Unmanned Autonomous Systems*)
11. Zhang, J., **Wen, W***., Huang, F., Wang, Y., Chen, X., & Hsu, L. T. (2022). GNSS-RTK Adaptively Integrated with LiDAR/IMU Odometry for Continuously Global Positioning in Urban Canyons. Applied Sciences, 12(10), 5193. (Paper)
12. **Wen, W**., and Hsu, L.T., 2021. 3D LiDAR Aided GNSS NLOS Mitigation in Urban Canyons. *IEEE transactions on intelligent transportation systems*. (Paper, Video) (*Knowledge Transfer to Unmanned Autonomous Systems*)
13. Bai, X., **Wen, W**.* and Hsu, L.T., 2022. Time-correlated Window Carrier-phase Aided GNSS Positioning in Urban Canyons, *IEEE Transactions on Aerospace and Electronic Systems*. (Paper)
14. Bai, X., **Wen, W**. and Hsu, L.T., 2021. Degeneration-Aware Outlier Mitigation for Visual Inertial Integrated Navigation System in Urban Canyons. *IEEE Transactions on Instrumentation and Measurement*, 70, pp.1-15. (Paper)
15. **Wen, W.**, Zhang, G. and Hsu, L.T., 2021. Gnss outlier mitigation via graduated non-convexity factor graph optimization. *IEEE Transactions on Vehicular Technology*, 71(1), pp.297-310. (Paper) (*Knowledge Transfer to Unmanned Autonomous Systems*)
16. **Wen, W**., Pfeifer, T., Bai, X. and Hsu, L.T., 2021. Factor graph optimization for GNSS/INS integration: A comparison with the extended Kalman filter. *NAVIGATION, Journal of the Institute of Navigation*, 68(2), pp.315-331. (Paper, Video) (*Top cited/downloaded paper*)
17. Zhang, J., **Wen, W. ***, Huang, F., Chen, X. and Hsu, L.T., 2021. Coarse-to-Fine Loosely-Coupled LiDAR-Inertial Odometry for Urban Positioning and Mapping. *Remote Sensing*, 13(12), p.2371. (Paper)
18. Yue, J., **Wen, W**. *, Han, J. and Hsu, L.T., 2021. 3D Point Clouds Data Super Resolution-Aided LiDAR Odometry for Vehicular Positioning in Urban Canyons. *IEEE Transactions on Vehicular Technology*, 70(5), pp.4098-4112. (Paper)
19. Huang, F., **Wen, W**., Zhang, J. and Hsu, L.T., 2021. Point-wise or Feature-wise? Benchmark Comparison of Public Available LiDAR Odometry Algorithms in Urban Canyons. *IEEE Intelligent Transportation Systems Magazine*. [***Accepted***] (Paper)
20. Bai, X., **Wen, W**. and Hsu, L.T., 2020. Robust visual-inertial integrated navigation system aided by online sensor model adaption for autonomous ground vehicles in urban areas. *Remote Sensing*, 12(10), p.1686. (Paper)
21. **Wen, W**., Bai, X., Zhang, G., Chen, S., Yuan, F. and Hsu, L.T., 2020. Multi-agent collaborative GNSS/camera/INS integration aided by inter-ranging for vehicular navigation in urban areas. *IEEE Access*, 8, pp.124323-124338. (Paper)
22. Zhang, G., Ng, H.F., **Wen, W**. and Hsu, L.T., 2020. 3D mapping database aided GNSS based collaborative positioning using factor graph optimization. *IEEE Transactions on Intelligent Transportation Systems*. (Paper)
23. Zhang, G., **Wen, W**., Xu, B. and Hsu, L.T., 2020. Extending shadow matching to tightly-coupled GNSS/INS integration system. *IEEE Transactions on Vehicular Technology*, 69(5), pp.4979-4991. (Paper)
24. **Wen, W**., Zhang, G. and Hsu, L.T., 2020. Object-Detection-Aided GNSS and Its Integration With Lidar in Highly Urbanized Areas. *IEEE Intelligent Transportation Systems Magazine*, 12(3), pp.53-69. (Paper)
25. Bai, X., **Wen, W. *** and Hsu, L.T., 2020. Using Sky-pointing fish-eye camera and LiDAR to aid GNSS single-point positioning in urban canyons. *IET Intelligent Transport Systems*, 14(8), pp.908-914. (Paper)

26. **Wen, W**., Bai, X., Kan, Y.C. and Hsu, L.T., 2019. Tightly coupled GNSS/INS integration via factor graph and aided by fish-eye camera. *IEEE Transactions on Vehicular Technology*, 68(11), pp.10651-10662. (Paper) (*Knowledge Transfer to Unmanned Autonomous Systems*)
27. **Wen, W**., Zhang, G. and Hsu, L.T., 2019. GNSS NLOS exclusion based on dynamic object detection using LiDAR point cloud. *IEEE transactions on intelligent transportation systems*. (Paper)
28. **Wen, W**., Zhang, G. and Hsu, L.T., 2019. Correcting NLOS by 3D LiDAR and building height to improve GNSS single point positioning. *Navigation*, 66(4), pp.705-718. (Paper) (*Top cited/downloaded paper*)
29. Zhang, G., **Wen, W**. and Hsu, L.T., 2019. Rectification of GNSS-based collaborative positioning using 3D building models in urban areas. *GPS solutions*, 23(3), pp.1-12. (Paper)
30. **Wen, W**., Hsu, L.T. and Zhang, G., 2018. Performance analysis of NDT-based graph SLAM for autonomous vehicle in diverse typical driving scenarios of Hong Kong. *Sensors*, 18(11), p.3928. (Paper)
31. **Wen, W**., Bai, X., Zhan, W., Tomizuka, M. and Hsu, L.T., 2019. Uncertainty estimation of LiDAR matching aided by dynamic vehicle detection and high definition map. *Electronics letters*, 55(6), pp.348-349. (Paper)

Journal/Conferences Publications In Submission or Under Submission/Revision: (*: Corresponding author)

1. Yan, P., **Wen, W**., **Huang, F**., and Hsu, L. T,. (2023). Fault Detection Algorithm for Gaussian Mixture Noises: An Application in LiDAR/IMU Integrated Localization Systems. *NAVIGATION: Journal of the Institute of Navigation*. *[Submitted]*
2. Xia, X., **Wen, W**., and Hsu, L. T,. (2023). Integrity-constrained Factor Graph Optimization for GNSS Positioning in Urban Canyons. *NAVIGATION: Journal of the Institute of Navigation*. *[Submitted]*
3. Zhu, J., Xia, X., Zhuo, G., Xiong, L., **Wen, W**., Leng, B., and Liu, W,. (2023). FG-MFI: Multisensor Fusion and Integration Localization based on Factor Graph. *IEEE Sensors*. *[Submitted]*
4. Bai, S., **Wen, W**. and Hsu, L.T*., 2022. Factor Graph Optimization-based Smartphone IMU-only Indoor SLAM with Multi-hypothesis Turning Behavior Loop Closures, *IEEE Transactions on Aerospace and Electronic Systems*. *[Submitted]*
5. Chen, Z., Chen, H., Qi, Y., Zhong, S., Feng, D., **Wen, W**., Jin, W. and Liu, M., 2023, May. RELEAD: Resilient Localization with Enhanced LiDAR Odometry in Adverse Environments. In 2024 *IEEE International Conference on Robotics and Automation (ICRA)*. IEEE. *[Submitted]*
6. Huang, F., **Wen, W**., Zhang, J*., Wang, C., and Hsu, L.T., 2023. Dynamic Object-aware LiDAR Odometry Aided by Joint Weightings Estimation in Urban Areas. *IEEE Transactions on Intelligent Vehicles*. *[Major Revision]*
7. Zhong, Y., **Wen, W***., & Hsu, L. T. (2022). Trajectory Smoothing Using GNSS/PDR Integration Via Factor Graph Optimization in Urban Canyons. *IEEE Internet of Things Journal*. *[Major Revision]*
8. Zhang, J., **Wen, W***. and Hsu, L.T., 2023. Safety-Certifiable Planar Feature-based LiDAR Localization with a Prior Map for Intelligent Vehicles in Urban Scenarios. *IEEE Transactions on Intelligent Vehicles*. *[Major Revision]*
9. Liu, X., **Wen, W***. and Hsu, L.T., 2023. 3D LiDAR Aided GNSS NLOS Mitigation for Reliable GNSS-RTK Positioning in Urban Canyons. *Journal of Geodesy*. *[Under Review]*
10. Zheng, X., **Wen, W***. and Hsu, L.T., 2022. Safety-quantifiable Line Feature-based Monocular Visual Localization with 3D Prior Map. *IEEE Transactions on Intelligent*

Transportation Systems. *[Major Revision]*

11. Hsu, L.T*, Cheng, M., **Wen, W**., Li, B., and Wen, C., 2023. Using GitHub as a Supplementary Educational Tool to Improve Problem-solving and Learning-to-learn Attributes, *Education Sciences*. [*Second Revision*]

Selected Representative Conference Publications (Past 5 Years):

1. Zhong, Y., **Wen, W*.**, and Hsu, L.T. 2023, September. Towards Accurate Vehicle-to-pedestrian Relative Positioning Aided by Inter-frame and Inter-agent GNSS Measurement Collaboration Using Factor Graph Optimization for Smart Summon. In *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023).*
2. Liu, X., **Wen, W*.**, and Hsu, L.T. 2023, September. 3D LiDAR-aided GNSS NLOS Correction by Reflecting Path Restoration using Reflection Map. In *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023).*
3. Liu, X., **Wen, W*.**, and Hsu, L.T. 2023, September. 3D LiDAR Aided GNSS NLOS Detection and Correction with Angle of Arrival Estimation Using Doppler Measurements. In *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023).*
4. Ng, H., Xu, P., Zhong, Y., Zhang, G., **Wen, W*.**, and Hsu, L.T. 2023, September. Differential Factor Graph Optimization with Intelligent Covariance Adaptation for Accurate Smartphone Positioning. In *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023).*
5. Zhang, H., **Wen, W*.**, and Hsu, L.T. 2023, September. A New GNSS Ambiguity Resolution Method Through Mixed Integer Non-Linear Programming. In *Proceedings of the 36th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2023).*
6. Sun, Y., Huang, F., **Wen, W**., Hsu, L. T., & Liu, X. (2023). MULTI-ROBOT COOPERATIVE LIDAR SLAM FOR EFFICIENT MAPPING IN URBAN SCENES. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 48, 473-478.
7. Leung, Y. T., Zheng, X., Ho, H. Y., **Wen, W**., & Hsu, L. T. (2023). Cost-effective Camera Localization Aided by Prior Point Clouds Maps for Level 3 Autonomous Driving Vehicles. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 48, 227-234.
8. Ho, H. Y., Ng, H. F., Leung, Y. T., **Wen, W**., Hsu, L. T., & Luo, Y. (2023). SMARTPHONE LEVEL INDOOR/OUTDOOR UBIQUITOUS PEDESTRIAN POSITIONING 3DMA GNSS/VINS INTEGRATION USING FGO. *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, 48, 175-182.
9. **Wen, W*.**, Zhang, J., Li, Bo., Wu, J. (2023, Sept). Workshop on Intelligent Vehicle Meets Urban: Safe and Certifiable Navigation and Control for Intelligent Vehicles in Complex Urban Scenarios-*2nd Edition, IEEE ITSC 2023. In 2023 IEEE 26th International Conference on Intelligent Transportation Systems (ITSC)*. IEEE. [*Accepted*]
10. Zhang, J., **Wen, W**., and Hsu, L.T, 2023, April. LiDAR Feature Outlier Mitigation Aided by Graduated Non-Convexity Relaxation for Safety-Critical Localization in Urban Canyons. In 2023 *IEEE/ION Position, Location and Navigation Symposium (PLANS)*. IEEE.

11. Yan, P., **Wen, W**., and Hsu, L.T, 2023, April. Extending Navigation Service under Sensor Failures: An Approach by Integrating System Identification and Vehicle Dynamic Mode. In 2023 *IEEE/ION Position, Location and Navigation Symposium (PLANS)*. IEEE.
12. Xia, X., **Wen, W**., and Hsu, L.T, 2023, April. Integrity-constrained Factor Graph Optimization for GNSS Positioning. In 2023 *IEEE/ION Position, Location and Navigation Symposium (PLANS)*. IEEE.
13. **Wen, W*.**, Li, B., Chen, J., Huang, Y. (2022, October). Workshop on Intelligent Vehicle Meets Urban: Safe and Certifiable Navigation and Control for Intelligent Vehicles in Complex Urban Scenarios, *IEEE ITSC 2022. In 2022 IEEE 25th International Conference on Intelligent Transportation Systems (ITSC)*. IEEE.
14. **Wen, W***. (2022, September). Tutorial on Enablers of Indoor Positioning and Navigation: From Radionavigation Fundamentals, Robotic SLAM, to Absolute Indoor GNSS, *In 2022 International Conference on Indoor Positioning and Indoor Navigation (IPIN). IEEE*.
15. **Wen, W**. and Hsu, L.T., 2022, September. Factor Graph Optimization for Tightly coupled GNSS Pseudorange/Doppler/Carrier phase/INS Integration: Performance In Urban Canyons of Hong Kong. In *Proceedings of the 35th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2022)*.
16. Zhong, Y., **Wen, W*.**, Ng, H., Bai, X., and Hsu, L.T. 2022, September. Real-time Factor Graph Optimization Aided by Graduated Non-convexity Based Outlier Mitigation for Smartphone Decimeter Challenge. In *Proceedings of the 35th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2022)*.
17. Huang, F., **Wen, W*.**, Ng, H., Hsu, L.T. (2022, October). LiDAR Aided Cycle Slip Detection for GNSS Real-Time Kinematic Positioning in Urban Environments, *IEEE ITSC 2022. In 2022 IEEE 25th International Conference on Intelligent Transportation Systems (ITSC)*. IEEE.
18. Bai, X., **Wen, W.**, Zhang, G., Ng, H., Hsu, L.T*. (2022, October). GNSS Outliers Mitigation in Urban Areas Using Sparse Estimation Based on Factor Graph Optimization, *IEEE ITSC 2022. In 2022 IEEE 25th International Conference on Intelligent Transportation Systems (ITSC)*. IEEE.
19. **Wen, W**. and Hsu, L.T., 2021, September. 3D LiDAR Aided GNSS Real-time Kinematic Positioning. In *Proceedings of the 34th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2021)* (pp. 2212-2220). (Paper, Video)
20. **Wen, W**., Meng, Q. and Hsu, L.T., 2021, September. Integrity Monitoring for GNSS Positioning Via Factor Graph Optimization in Urban Canyons. In *Proceedings of the 34th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2021)* (pp. 1508-1515). (Paper, Video)
21. Zhang, J., **Wen, W**., Huang, F., Chen, X. and Hsu, L.T., 2021, September. Continuous GNSS-RTK Aided by LiDAR/Inertial Odometry with Intelligent GNSS Selection in Urban Canyons. In *Proceedings of the 34th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2021)* (pp. 4198-4207). (Paper, Video)
22. Huang, F., Shen, D., **Wen, W**., Zhang, J. and Hsu, L.T., 2021, September. A Coarse-to-Fine LiDAR-Based SLAM with Dynamic Object Removal in Dense Urban Areas. In *Proceedings of the 34th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2021)* (pp. 3162-3172). (Paper, Video)
23. Ng, H.F., Zhang, G., **Wen, W**. and Hsu, L.T., 2021, September. 3D Mapping Aided GNSS

Using Gauss-Newton Algorithm: An Example on GNSS Shadow Matching. In *Proceedings of the 34th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2021)* (pp. 1954-1960). (Paper)

24. Hsu, L.T., Kubo, N., **Wen, W**., Chen, W., Liu, Z., Suzuki, T. and Meguro, J., 2021, September. UrbanNav: An open-sourced multisensory dataset for benchmarking positioning algorithms designed for urban areas. In *Proceedings of the 34th International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2021)* (pp. 226-256). (Paper)
25. **Wen, W**. and Hsu, L.T., 2021, May. Towards Robust GNSS Positioning and Real-time Kinematic Using Factor Graph Optimization. In 2021 *IEEE International Conference on Robotics and Automation (ICRA)*. IEEE. (Paper, Video, Code)
26. **Wen, W**., 2020, September. 3D LiDAR Aided GNSS and Its Tightly Coupled Integration with INS Via Factor Graph Optimization. In *Proceedings of the 33rd International Technical Meeting of the Satellite Division of The Institute of Navigation (ION GNSS+ 2020)* (pp. 1649-1672). (Paper, Video) (*Best Presentation Award*)
27. Fang, W., Li, H., Dang, S., Huang, H., Peng, L., Hsu, L.T. and **Wen, W**., 2019, December. Combining deep gaussian process and rule-based method for decision-making in self-driving simulation with small data. In 2019 15th *International Conference on Computational Intelligence and Security (CIS)* (pp. 267-271). IEEE. (Paper)
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Weisong Wen

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GNSS
NLOS/Multipath Mitigation
LiDAR SLAM
Navigation
Robotics

	All	Since 2018
Citations	1265	1265
h-index	20	20
i10-index	31	31

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